

# RECENT NEUROLINGUISTIC AND PSYCHOLINGUISTIC THEORIES ON RIGHT HEMISPHERE INVOLVEMENT IN LANGUAGE FUNCTION

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In an investigation of the linguistic abilities of the right or nondominant cerebral hemisphere, it is important to bear in mind the distinction between receptive (listening and reading) and productive (speaking and writing) skills. This paper attempts to highlight recent findings in neurolinguistic and psycholinguistic research on right hemisphere involvement in language function and argues that more stringent assessment methods are needed to clearly distinguish among performances in the four modalities listening, speaking, reading, and writing.

Regarding the receptive skills of the right hemisphere, authors seem to agree that it can accomplish a considerable amount of tasks. According to Nebes (1978:131), the right hemisphere can understand rather complex syntactical constructions. According to Krashen (1976:179), the right hemisphere has a limited but existing ability to comprehend or learn to comprehend speech. The right hemisphere's abilities in the reading modality have been investigated by Dick (1976). Dick studied the spatial abilities of the two hemispheres and reported a left visual field advantage for reading a row of letters.

When a row of letters is shown bilaterally, thereby establishing a competition between fields, the left visual field is reported more accurately. . . . Support for the reading habit bias is provided both by examination of Hebrew readers who show a reverse tendency and by the difficulty English readers have in reporting alphabetical materials from right to left with tachistoscopic presentations (Dick 1976:253).

Other evidence for the receptive abilities of the right hemisphere has been provided by Searleman (1977).

Searleman reported that in dichotic listening tests with split-brain patients, the right hemisphere showed the ability to process not all of the stimuli presented to the left ear but only very specific ones.

For example, it has been reported that commissurotomy patients who couldn't report the left ear input during dichotic presentation of consonant-vowel pairs were often able to process the left ear stimuli when pairs of animal names such as doggy/horse were substituted instead. (Searleman 1977:518).

In the light of such findings, one might ask whether there are certain speech features that can be processed either bilaterally or exclusively by the nondominant hemisphere. Such an assumption seems even more plausible if one thinks of the experiments where a right ear advantage was found for the perception of initial stop consonants and for the articulatory features of voicing and place whereas no ear advantage could be found for steady-state vowels. Also, it appears that there is evidence that other linguistic features of speech, e.g., intonation contours and pitch qualities, are not only processed bilaterally but are frequently better processed by the right hemisphere than by the left.

What can be seen from the reports on right hemisphere receptive abilities is the need for a more accurate description not only of test materials but also of the skills examined in a given experiment. More precisely, it is not sufficient to speak about the ability to "comprehend" language. Additional information must be provided on the modality (listening or reading) in which this ability was observed and on the method by which a certain skill was assessed. Also, a precise characterization of the stimuli presented, e.g., vowels, plosives, fricatives, etc., will make it possible to obtain a clearer picture about the processing abilities of each one of the two hemispheres and their integrative actions. Obviously, different cerebral mechanisms are responsible for visual input on the one hand and auditory input on the other. To gain more insight into these mechanisms, it seems desirable that experimental techniques be developed which involve only one or the

other of the two receptive modalities (listening and reading). The main problem, of course, is to assess an individual's comprehension abilities without having recourse to his productive skills. In many experiments, there is only one way to find out about the test subject's receptive skills, namely by posing him questions. Yet, as soon as the subject has to use his or her productive skills, it becomes extremely problematic to decide whether a certain deficit is due to impairment of speech production or attributable to deficient speech comprehension. It is interesting to note in this context that aphasiologists have been trying for a long time to solve this problem. For example, Eisenson (1954) suggested the use of objects or pictures for the assessment of receptive abilities. Stipulating various procedures for the assessment of auditory verbal aphasia, Eisenson (1954:13) notes: "We may test for auditory verbal aphasia by asking a patient to identify objects or pictures. On a higher level auditory verbal aphasia may be tested by directing a patient to carry out orally presented directions." Another possibility to circumvent speech production would be matching tests in which the patient has to match words or sentences to pictures.

As can be seen, in spite of numerous reports on the right hemisphere's abilities to comprehend language, one must be critical of the assessment methods that have been used in certain experiments. In assessing an individual's comprehension abilities it can happen easily that the results reflect more his performance in the productive skills than in the receptive skills.

Regarding the expressive abilities of the non-dominant hemisphere, it is surprising to observe that the existing literature provides a considerable amount of information. After all, in the past the right hemisphere had been credited only with a few primitive receptive abilities, and it is only most recent research that places more emphasis on the productive skills. Information on the right hemisphere's abilities in the writing modality has been provided by Nebes (1978:106). According to Nebes, the writing abilities of the minor hemisphere became apparent in two young commissurotomy patients who were able to produce words blindly with the left hand although they were incapable of verbalizing these

words. One of these patients succeeded in arranging letters with his left hand to create a new word. He was also able to write a word with his left hand after having felt its letters, which had been arranged in the correct order. The other patient was able to use his left hand for copying into script printed nouns and verbs that had been flashed in his left visual field. What deserves particular mention is the patient's inability to name the words he had written. According to Nebes (1978:106), this inability proves that the "speaking" left hemisphere did not participate in the production of written language.

Other information on writing abilities of the non-dominant hemisphere has been provided by Bogen (1976) and Levy, Nebes, and Sperry (1971). Bogen not only reviewed the literature on commissurotomy patients but presented also his own observations. These observations seem to indicate "that there is a time when writing can be produced by a nonspeaking single hemisphere . . . " (Bogen 1976:221). Bogen's statement obviously supports the claim made by Levy et al. (1971) who observed that in the long-term chronic condition, the nonspeaking minor hemisphere occasionally has the ability to accomplish writing tasks. As early as 1971, Levy and coworkers examined the disconnected right hemisphere's ability to express language. In a study on two split brain patients, they observed "that words could be expressed via left hand motor mechanisms when stimulus input was confined to the right hemisphere" (Levy, Nebes, and Sperry 1971:56). Levy and coworkers interpreted this observation in the sense that the nondominant hemisphere has some capacity to produce at least simple language through control of the left hand.

Besides these reports on the writing abilities of the right hemisphere, there exists also information on other expressive abilities. In a study on cerebral asymmetry, Krashen (1976:177) drew attention to the so-called "automatic" language. "Automatic" language frequently is contrasted with "propositional" speech and includes greeting formulas, overused or overlearned expressions, idioms, swearing and other emotional expressions, commands, and pause fillers, such as "you know," "and so forth," etc. Somehow related to automatic speech are the so-called "ictal speech mechanisms"

which consist of words or grammatical utterances and are used frequently by psychomotor epileptics before, during or subsequent to a seizure. In the light of information on automatic speech coming from reports on a split brain patient, dichotic listening experiments with normal subjects, and epileptics, Krashen suggests that the right hemisphere makes an essential contribution to the production of automatic speech.

Automatic language may involve the right hemisphere, in that common expressions, idioms, etc., are most likely stored and retrieved as wholes; their meanings are not determined merely by their lexical items and syntactic structure, as is the case in propositional language. Simply associating automatic language with the holistic properties of the right hemisphere is insufficient . . . (Krashen 1976:177)

As can be seen, the right hemisphere's ability to produce automatic language seems to be well documented. Moreover, some reports suggest that the right hemisphere might even be capable of producing some propositional speech. According to Krashen (1976:179), the report of a left hemispherectomized subject whose propositional speech continued to increase might prove the right hemisphere's ability to produce propositional language. The same report supports the claim that the nondominant hemisphere is skilled at attaching noun labels to objects and pictures and that it is quite capable of learning vocabulary. Additional evidence for the right hemisphere's ability to produce language has been provided by Nebes (1978:104). As Nebes reports, split brain patients have been found capable of uttering short words in visual field tests and of verbalizing single digits. "Thus, at least some commissurotomy patients can produce a correct verbalization to a left-field visual stimulus . . . " (Nebes 1978:105).

Perhaps the most convincing evidence for right hemisphere speech comes from a report on right-handed stroke patients suffering from aphasia. According to Nebes (1978:103), the speech of these patients was not affected by anesthetization of the left hemisphere but

disappeared after anesthetization of the right hemisphere. It is legitimate therefore to conclude that in these patients the postmorbidity speech production had its origin in the minor hemisphere.

As can be seen from the foregoing discussion, a considerable amount of information on the right hemisphere's productive abilities is available. At the same time, it must be emphasized that there exists even more information on the receptive skills of the nondominant hemisphere. Thus, one can conclude that even if the expressive abilities of the right hemisphere are not as well documented as the receptive skills, it is worthwhile to subject them to a closer examination. The development and application of new assessment methods might make it possible to discover abilities which cannot be identified with presently employed test techniques.

It is interesting to note in this context that as early as 1962, Eisenson already attributed certain linguistic abilities to the right hemisphere. On the basis of a comparison between right-brain damaged subjects and control groups in verbal tests, Eisenson concluded that the right hemisphere may possess some "extraordinary" linguistic skills. This conclusion was supported by Critchley (1962) who observed that right-lesioned patients can have word finding problems and difficulty in learning new linguistic material. One has to await the results of future research before it is possible to raise these speculations to the status of a hypothesis or theory. At this moment, it seems important to bear in mind how crucial it is to assess the right hemisphere's linguistic abilities in each single modality (listening, speaking, reading, and writing) without utilizing cross-modality test techniques. Only if each one of these modalities can be tested independently from the others, will it be possible to gain more insight into the functioning of those cerebral mechanisms that are involved in the processing of language and speech.

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